Nautical ENGINEERING Queries

1. In order for the hydraulic pump installed in a constant flow system to maintain adequate flow, the pump suction should _____.

A. be taken directly off the reservoir bottom without regard to filters or strainers
Incorrect Answer: If the pump suction were to be taken off the reservoir bottom, contaminants such as water, sludge and other impurities may be drawn into the pump, resulting in damage to the pump internals and system components.

B. be arranged to develop a maximum vacuum of approximately 10 inches of mercury
Correct Answer: Fluid flow velocity in suction piping typically ranges from 2 to 4 feet per second, at a maximum of 10 inches of mercury vacuum. Higher fluid velocities and/or vacuums may result in pump cavitation. Cavitation occurs when the pump suction pressure drops below its vapor pressure causing gas pockets and bubbles to form. The gas pockets become entrained in the fluid entering the pump. As the fluid/vapor mixture moves from an area of low pressure to high pressure, the vapor bubbles compress and collapse. This results in pits or cavities forming on the pump internal surfaces. Turbulent flow develops in the pitted areas resulting in reduced oil flow to the system, higher operating temperatures, and wasted power.

C. be arranged to develop the theoretically maximum attainable vacuum
Incorrect Answer: The higher the vacuum, the greater the tendency for vaporization to occur and the greater the possibility of damaging the pump through cavitation (see explanation for Answer "B").

D. be provided with three to five half-inch holes in the vertical, suction line to prevent pump starvation should the strainer become fouled
Incorrect Answer: Holes in the suction line would allow solid contaminants to enter the pump, resulting in damage to the pump and other system components. Air may also be drawn into the pump through these exposed holes should the level in the reservoir decrease or surge due to the ships motion in heavy seas.

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2. To properly seat the brushes on slip rings, you should use _____.

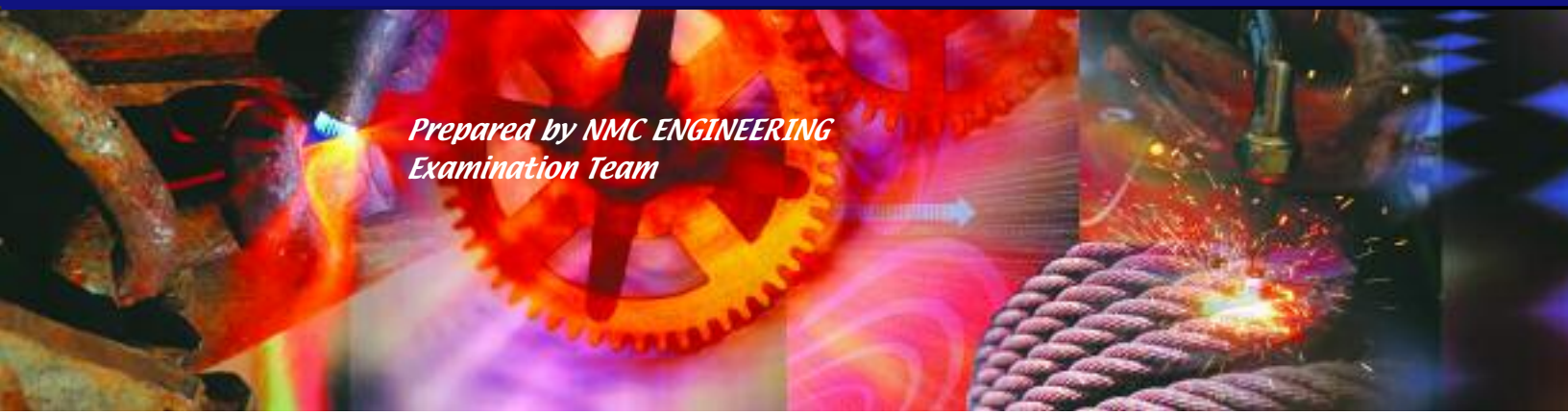
Note: Slip rings are commonly found in electrical AC generators and motors to establish an electrical connection to or from the rotating shaft. The slip ring consists of a conductive band mounted on, but insulated from, the rotating shaft. "Brushes", solid segments of carbon, are placed in fixed, spring loaded fixtures to maintain contact with the ring and transfer electric current to the load as the shaft rotates. DC generators and motors have a similar arrangement, but utilize a commutator instead of a slip ring. The seating of all brushes to the exact curvature of the ring is essential to provide for the largest contact surface area possible. Improper seating of brushes will result in an uneven concentration of electrical load between brushes. This will cause some brushes to carry a greater portion of the current load, resulting in damage to the slip ring surface film and brush face.

A. sandpaper
Correct Answer: With the machine de-energized, fine sand paper should be used to seat the brushes. The brush tension should be set for maximum pressure, and the sand paper should be pulled back and forth along the curvature of the slip ring under the brush with the rough side facing the brush. When pulling the sand paper under the brushes, it is important to follow the curvature of the slip ring to avoid rounding the brush edges, which will also reduce the brush contact surface area. Once the seating of the brushes has been completed, the carbon particles (dust) must be removed from the surface using a vacuum cleaner.

B. crocus cloth
Incorrect Answer: Crocus cloth is extremely fine and is primarily used for polishing. The surface of the crocus cloth would rapidly clog, rendering it ineffectual for forming the curvature on the brush face.

C. emery cloth
Incorrect Answer: Emery cloth, while extremely abrasive, is comprised of relatively small particles. The abrasives would easily become imbedded in the "voids" between the carbon structure of the brushes and later score the slip ring surface, whereas sand particles are larger and would not as readily become imbedded in the brush contact surface.

D. all of the above
Incorrect Answer: "A" is the only correct answer



3. When answering a full astern bell from half ahead, the superheater outlet temperature in a single furnace boiler will _____.

Note: "Answering" a bell is considered the time interval from the moment the order to change speed/direction is rung up on the engine order telegraph, to the moment the required engine speed is achieved.

A. increase sharply with the increased firing rate
Incorrect Answer: The increased firing rate should not result in a sharp increase in the superheat temperature, provided proper combustion conditions are maintained. The superheat temperature should drop initially, and then rise steadily and gradually as the rate of combustion goes up to meet demand.

B. decrease due to the increase steam volume used
Correct Answer: When answering a full astern bell from half ahead, the superheat temperature will drop when steam is first admitted to the astern turbine. The astern turbine requires a greater volume of steam than the ahead turbine, and will result in an increase in the rate of steam flow through the superheater. The increase in the rate of steam flow through the superheater decreases the amount of heat the steam can absorb from the combustion of fuel oil, and the superheat temperature drops. In addition, the increase in rate of steam flow and drop in steam pressure, results in an increase in the firing rate, which results in a rise in the boiler water level (swell). This increases the possibility of moisture carryover into the superheater, and resultant decrease in superheater temperature.

C. decrease momentarily and then increase proportionally with load demand
Incorrect Answer: The superheat temperature drop would not be a momentary decrease, and it would require some time from the initial admittance of steam to the astern element, before the rate of combustion goes up to meet demand, and the superheat temperature gradually begins to rise.

D. remain the same
Incorrect Answer: The boiler superheat temperature will increase or decrease in response to load changes while maneuvering, and will remain the same under steady state conditions only.

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4. Which of the following statements is correct concerning a typical shipboard multi-coil refrigeration system?

A. The liquid receiver functions to collect and remove non-condensable gases.
Incorrect Answer: The receiver serves as a temporary storage and surge space for the sub-cooled liquid refrigerant discharged from the condenser. The receiver also serves as a vapor seal to prevent the entrance of vapor into the liquid line to the thermostatic expansion valve (TXV).

B. A thermostatic expansion valve is used to control refrigerated space temperature.
Incorrect Answer: A thermostatically controlled solenoid valve normally controls box temperature. Back-pressure valves are also used in multi-coil refrigeration systems to raise coil temperatures in higher temperature refrigerated spaces. The back pressure valve is located at each evaporator outlet, except on the evaporator in which the lowest temperature is to be maintained. The back-pressure valve is normally set to prevent the pressure in the coil from falling below the pressure corresponding to the lowest temperature required in the space.

C. Refrigerant temperature in an evaporator is directly related to refrigerant pressure.
Correct Answer: The thermostatic expansion valve (TXV) is used to maintain a constant degree of superheat in the refrigerant leaving the evaporator coil by adjusting the flow of liquid refrigerant entering the evaporator. An increase in the degree of superheat will result in the TXV opening to allow more refrigerant to the coil, and a decrease in superheat will tend to close the TXV, reducing the refrigerant flow to the coil.

D. Dehydrators must be used continuously in a refrigeration system.
Incorrect Answer: A dehydrator is installed in the liquid refrigerant line to remove moisture from the system. It should be in use when charging the system, or when moisture is suspected to be present in the refrigerant.